least) was obtained by continuing the observations of the stars throughout the whole of the year, that is, to secure observations in all positions of the parallactic ellipse. If the measures were confined to those epochs when the parallactic displacements were greatest, and a sufficient number of observations secured at those critical times, a determination of parallax could be relied upon to within about one-thirtieth of a second of arc. This is approximately the limit of accuracy that Professor Pritchard hoped to reach, and in this selection he appears to have been guided by the conviction, that in the present condition of cosmical inquiries, to which stellar parallax bears the closest relation, it is of more importance to know within very narrow limits the parallaxes of many stars than seek with the utmost accuracy the parallax of a very few. And in this respect there can be no doubt but that Prof. Pritchard's judgment is correct. The former is the view of a philosopher; the latter that of a conscientious and painstaking observer. Guided by the broader view, the result of his work has been to enrich the data at the command of students of cosmical science by assigning the approximate distance to some thirty stars, a number which bears no inconsiderable proportion to the total number of separate determinations made by all other astronomers combined.

Prof. Pritchard's view of the history of stellar parallax is that of a scientific struggle, a continual and severe wrestle on the part of the astronomer with the inevitable inaccuracy of observation and imperfect instruments, in which sometimes one opponent, sometimes the other, has the mastery. He passes in his historic survey rapidly over those days when from various obvious causes the detection of stellar parallax was scarcely possible, moved however to admiration by, and induced to linger over, the success that attended the early observations of Molyneux in the case of γ Draconis when discussed, a century later, by Auwers, a success that later observers have struggled to repeat ineffectually. He brings before us, but touches with a light and kindly hand, the dispute that embittered the lies of Brinkley and of Pond, but it is not difficult in reading a little between the lines to see with whom his sympathies rest. Later on in the history of the research, Henderson meets with his deserts, as a clear-sighted astronomer of distinguished ability, cautious and persevering, and one who in the struggle after accuracy obtained an undoubted measure of success. This historical introduction will we think be read with pleasure by many who may have no particular interest in this special subject of inquiry. The comments of one who has encountered and overcome many similar difficulties, and has kindly sympathy with all who have travelled along the same path, cannot but be of interest and of value, and we could have wished that this portion of the book had been considerably extended. How many astronomers are now acquainted, with any degree of adequacy, with the serious difficulties that attended the early application of the heliometer in this department of research, and with the dispute that raged long and dubiously around the names of Wichmann and of Schluter? All are willing to admit that in the hands of many competent observers—it would be invidious to mention any without naming all—the heliometer is doing splendid work, but the difficulties with which the early masters had to cope are now all but forgotten, and it is certainly wise to treasure a sympathetic remembrance for the earlier exponents of the improved and successful methods now in vogue.

The last portion of Prof. Pritchard's history is occupied with the bearing of stellar parallax on the problem of the construction of the stellar universe. He seems to have had before his mind two questions, which, long hovering in an unexpressed form, were first formally enunciated by Dr. Gill. The first question is, What are the average parallaxes of stars of the first, second, third, and fourth magnitude respectively compared with those of fainter magnitude? To this question the Savilian Professor replies very cautiously. The researches of Dr. Elkin on stars of the first magnitude point to an average parallax of 0″·089 for stars of that class, and just as certainly Prof. Pritchard's researches point to an average parallax of 0″·056 for stars of the second magnitude. But he pertinently asks what can be understood by an average of distances (as indicated by parallaxes) in cases where the separate elements vary from actual zero to half a second, and where moreover many of the brighter members are the furthest removed from us? Notwithstanding these exceptional cases, which challenge attention, the fact remains, and it is apparently the only conclusion which can be drawn with any certainty, that the stars of the first magnitude are on the whole nearer to us than those of the second, and that these again are as a whole nearer to us than the faint stars with which they have been compared. With conclusions of this sort it would seem that astronomers will have to content themselves for some time to come.

The second question which Dr. Gill suggested or formulated was—What connection does there exist between the parallax of a star and the amount and direction of its proper motion?—or can it be proved that there is no such connection or relation? The answer given to this second query is even less satisfactory than to the former. Prof. Pritchard contents himself by exhibiting in a tabular form the parallax and the proper motion of all stars that have been successfully handled, and the only conclusion drawn or warranted, is a suggestion that there is at least quite as close a connection between the apparent proper motion of a star and its distance from us, as there is between its distance and its magnitude.

If we examine or attempt to trace any connection between the mass, the brilliancy and the distance of a star, we are baffled by the same kind of uncertainty, arising in some measure from the paucity of instances in which it is possible to make the inquiry, and we are reluctantly forced to admit that such investigations are premature. At least that would be the conclusion of an ordinary mind, but here it is that Prof. Pritchard sees his opportunity for future efforts and renewed vigour. With an energy that must be the admiration of his friends, he selects for further investigation two subjects, either of which might fully occupy the time and the hands of a younger man. He proposes in the first place to determine the parallaxes of several stars of the Pleiades, a few of the brighter as well as a few of the fainter, with the view of discovering whether the faint and the bright are indiscriminately mixed at that distance. The second subject of his proposed inquiry is not less interesting. It consists in the investigation of the distances of some of the binary systems from our sun; and from a more complete knowledge of the masses, the mutual distances, and the parallaxes of these systems, Prof. Pritchard thinks it not unlikely that many interesting and possibly unexpected associations may reasonably be anticipated, thereby affording us some further insight into the constitution and the mechanism of the Stellar Universe. We can only hope that Prof. Pritchard's health and strength may be spared to witness the completion of this programme, but in that case we are assured he would immediately sketch out for himself some new field of inquiry, and court even longer and more protracted labour.

CONTRIBUTIONS TO THE STUDY OF DISINFECTION.[1]

PROFESSOR J. MASCHEK, whose name is already familiar to us through his investigations on water bacteria, has brought together in pamphlet-form a large number of experiments on the relative value of various disinfectants and disinfectant processes. Since the introduction of Koch's methods, the study of the subject of disinfection has been immensely assisted, and it is now possible to take a more accurate measure of the extent to which micro-organisms are affected by different treatment, whether chemical or mechanical. The stimulus which it has thus received has not unnaturally drawn a large number of workers into this particular field of inquiry, and the literature is already very unwieldy.

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[1] "Beiträge zur Theorie und Praxis der Desinfection, von Prof. J. Maschek." Im Selbstverlage des Verfassers, Leitmeritz.

One of the principal difficulties which surround the study of micro-organisms is their individuality, their apparent idiosyncrasies, and this is not confined to closely allied varieties, but is found amongst members of one and the same species. Thus, the previous history of a micro-organism, the nature of the culture material used, the temperature at which the cultivation has been kept, the age of the growth, &c., are all points which have to be taken into consideration as likely to influence the behaviour of the particular specimen under observation. This sensitiveness of bacteria may possibly to some extent account for the discrepant results which have been obtained by different investigators, although working in similar directions, which has rendered the accurate appreciation of the value of these results a by no means easy task. Again, what succeeds in a laboratory is not necessarily equally successful when carried out on a large scale, and it is this difficulty which has so frequently led to such disappointing results in actual practice.

Prof. Maschek has endeavoured by a series of most arduous and painstaking experiments to throw a little more light on some of the problems of disinfection, and in gathering up his work has wisely abstained from attempting an exhaustive survey of the general literature, restricting himself to a brief introduction and particular reference to those investigations with which he has been more closely concerned. In the majority of the experiments the author employed Koch's well-known method of sterilized silk threads, each of which was subsequently impregnated with pure cultivations of a number of different pathogenic micro-organisms. These were distributed in various parts of a room about 19-ft. long, 13-ft. wide, and 15½-ft. high, on the ceiling, walls, corners, floor, &c., whilst in some cases they were wrapped up in different materials, such as filter-paper, muslin, linen, in order to imitate as nearly as possible the actual conditions under which the organisms might be supposed to be present in an infected room. In each case, after the application of the disinfectants under observation, these silk threads were submitted to plate-cultivation, and in some instances their pathogenic properties were also tested by inoculation into animals.

The first elaborate series of experiments was made with the vapour of corrosive sublimate, which some authorities have recommended as an effective germicidal agent; but quite apart from the difficulty of getting rid of the poisonous crystals of corrosive sublimate which remained attached to various parts of the room, Prof. Maschek was not able to obtain satisfactory results, although every precaution was taken to ensure success. In this respect his experiments differ from those of König, who confidently recommended its use for disinfection purposes. The effect of chlorine gas was next tested and applied both in the dry and damp state. The results were, however, far from encouraging, for even when employed in the damp state the spores were not destroyed. In connection with these experiments a very instructive instance is given of the signal failure which accompanied the use of chlorine in the Alexander Hospital in St. Petersburg, which was designed for receiving different infectious illnesses. Suspicion as to its efficacy was first aroused after its use in the disinfection of a ward in which diphtheria patients had been treated. This ward was afterwards used for scarlet fever cases, and subsequently complications with diphtheria made their appearance, in consequence of which the ward was closed and disinfected with chlorine. (A ward of 900 cubic metres capacity being subjected to the chlorine gas evolved in treating 50 kilos. of chloride of lime with 65 kilos. of hydrochloric acid.) After the disinfection was completed, the ward was thoroughly cleansed and ventilated, and allowed to remain empty for seven months. On its being re-opened for the reception of measles cases complications with diphtheria again arose, although the patients when taken into the ward were wholly free from diphtheria. The measles patients were therefore removed, and the ward was again disinfected with chlorine, only this time a much larger quantity was employed (135 kilos. of chloride of lime with 148·5 kilos. of hydrochloric acid) after which it stood empty for another seven months. Later on cases of smallpox were received into this ward, but diphtheria again appeared, the physician, two nurses, and an attendant being amongst those attacked, whilst complications with diphtheria again occurred amongst the patients. In consequence of this the unfortunate ward was once more closed and thoroughly disinfected with chlorine, and was reopened for typhoid fever patients; but all children's cases were rigorously excluded, in consequence of their particular susceptibility to diphtheria. After the adoption of this special precaution no further attacks of diphtheria were met with. It might, however, be urged that as regards the infection of patients suffering from measles with diphtheria, the disease was possibly introduced from outside, and did not necessarily arise in the ward itself, were it not for the fact that there were three other wards in the hospital in which cases of measles were being treated at the same time, and no single attack of diphtheria occurred. Krupin, who is the authority for these facts, confirming the valuelessness of chlorine for disinfecting purposes, found that the spores of anthrax were not destroyed in a hospital ward after being exposed to the action of this gas for more than 40 hours.

A large number of experiments were made with a view to determining the number of micro-organisms present on the walls of a room. For this purpose a small sterilized bit of sponge cut in the shape of a cube (of about half-inch side) was used to rub down a measured portion (about 4 square inches) of the wall. The sponge was afterwards placed in a tube containing sterile melted gelatine and rotated gently, so as to disengage all the organisms on its surface. The gelatine was then allowed to congeal on the sides of the tube, and after suitable incubation the colonies made their appearance, and were estimated in due course. It was found that the numbers present on the walls and ceiling respectively varied considerably. Near the floor the number was much greater than on the middle of the wall, whilst here again they were more abundant than on the ceiling. For example, on one of the walls, at a distance of rather more than an inch from the ground, as many as 2,871 microbes were found, whilst on the ceiling over a similar area only 85 were discovered. It was also noticed that those portions of the wall or ceiling which were exposed to currents of air from either the window or door exhibited generally a smaller number of bacteria than did places which were shielded from such draughts. Prof. Maschek further found that one rubbing was wholly insufficient to remove all the organisms from a given surface, and it was only after the process had been repeated five times that all bacterial life could be banished with certainty. Although the figures thus obtained are of interest by way of comparison, yet it is difficult to believe that they represent the *actual* numbers present. The accuracy of this method, originally devised by Esmarch, rests on the assumption that on placing the sponge in the tube of melted gelatine and rotating it gently (for if this were done violently the gelatine would froth, and the surface become covered with small bubbles, which would greatly interfere later with the counting of the colonies) all the organisms attached to the surface of the sponge would be removed. Now the sponge being left in the tube must necessarily obscure part of the gelatine surface; moreover, the interstices becoming soaked with gelatine, colonies would certainly develop within the sponge itself and escape detection, whilst it is quite inconceivable that gentle rotation would suffice to detach even all those organisms which are adherent even to the surface of the sponge.

Wall surfaces deprived of micro-organisms in the manner described above were subsequently sprayed with distilled water infected with different pathogenic bacteria, and after sufficient time had elapsed for these surfaces to dry, the effect of various disinfectants was tried. Numerous investigations are also recorded of the use of creolin, carbolic acid, and mixtures of the latter with solutions of corrosive sublimate. The effect of exposure to high temperatures, in apparatus specially constructed for the purpose, has also been tried, whilst the disinfection of sewage matters with lime is also carefully considered, and a large number of experiments recorded with the typhoid and cholera organisms.

The following interesting account is given as an illustration of the success which can be achieved in disinfection on a large scale. An epidemic of diphtheria broke out in a small village in Germany and proved particularly fatal amongst the children, indeed so alarming was its progress, that the Burgomaster was led to suggest the disinfection of the whole village. A public meeting was held and the inhabitants were instructed as to the nature of the epidemic, and the possibility of checking it by the combined action of every household. Public funds were devoted to the purchase and distribution of the requisite disinfectants, and during three days the whole place is described as smelling of carbolic, whilst in all directions windows and doors were to be seen wide open, a very unusual sight in the country, and more especially in the month of February when this occurred. The work of disinfection was carried on most systematically, every article which could not be either washed or baked was treated with a 5 per cent. solution of carbolic acid. In short, no efforts were spared to thoroughly disinfect everything, and the result was that although the epidemic before the commencement of this disinfecting crusade was steadily gaining ground, it suddenly stopped. This must be considered as a tribute to the sagacity and energy of the inhabitants; for, as Prof. Maschek points out, experience teaches us to expect a gradual decline, due to the possible weakening of the virus, so that towards the end of an epidemic the number of bad cases is lessened and recoveries are more frequent.

In conclusion the words of M. Duclaux may be appropriately quoted: "Les études sur les antiseptiques n'ont gagné que de s'encombrer de résultats qui se contredisent les uns les autres, et entre lesquels on ne peut faire un choix, précisément parcequ'ils ont été souvent obtenus en dehors des conditions d'une étude précise. Il faut donc abandonner cette méthode, scruter avec de plus en plus de soin la phénomène, faire de la science, en un mot." This "*faire de la science*" is precisely the spirit in which Prof. Maschek has carried out his experiments; the immense care with which they have been conducted, the ungrudging labour bestowed upon them should render his results a most valuable contribution to the subject of disinfection. It is only to be regretted that they are not published in a form in which they would be more likely to become known and appreciated.

GRACE C. FRANKLAND.

AN ETHNOGRAPHICAL SURVEY OF THE UNITED KINGDOM.

A CIRCULAR letter, which we have been asked to print, has just been issued on behalf of the Committee appointed by the British Association to organize an ethnographical survey of the United Kingdom. The Committee consists of Francis Galton, F.R.S., J. G. Garson, M.D., and E. W. Brabrook, F.S.A., representing the Anthropological Institute; Edward Clodd, G. L. Gomme, F.S.A., and Joseph Jacobs, M.A., representing the Folklore Society; H. S. Milman, Director S.A., George Payne, F.S.A., and General Pitt-Rivers, F.R.S., representing the Society of Antiquaries of London; Joseph Anderson, LL.D., Secretary of the Society of Antiquaries of Scotland; and A. C. Haddon, M.A., Professor of Zoology at the Royal College of Science of Dublin. The following is the circular letter:—

SIR,—The above-named Committee, in pursuance of the object for which they have been delegated by the Society of Antiquaries of London, the Folk-lore Society, and the Anthropological Institute, and appointed by the British Association, propose to record for certain typical villages and the neighbouring districts—

(1) Physical Types of the Inhabitants.
(2) Current Traditions and Beliefs.
(3) Peculiarities of Dialect.
(4) Monuments and other Remains of Ancient Culture; and
(5) Historical Evidence as to Continuity of Race.

As a first step, the Committee desire to form a list of such villages in the United Kingdom as appear especially to deserve ethnographic study, out of which a selection might afterwards be made for the Survey. The villages suitable for entry on the list are such as contain not less than a hundred adults, the large majority of whose forefathers have lived there so far back as can be traced, and of whom the desired physical measurements, with photographs, might be obtained.

It is believed by the Committee that such villages may exist in the districts with which you are acquainted, and, as you are eminently capable of affording help in this preliminary search, we have to request that you will do so by kindly furnishing the names of any that may occur to you, with a brief account of their several characteristics; mentioning at the same time the addresses of such of their residents as would be likely to support the Committee in pursuing their inquiry.

They would also be glad to be favoured with the names of any persons known to you in other districts to whom this circular letter might with propriety be addressed.

We are, Sir,
Yours faithfully,
FRANCIS GALTON, *Chairman.*
E. W. BRABROOK, *Secretary.*

All communications should be addressed to "The Secretary of the Ethnographic Survey, British Association, Burlington House, London, W."

NOTES.

THE Board of Trinity College, Dublin, on October 22 elected Dr. Arthur A. Rambaut, M.A., Royal Astronomer of Ireland, on the foundation of Dr. Francis Andrews. The election was made under the provisions of Letter Patent 32 George III., dated in 1792. The new Professor of Astronomy in the University of Dublin, graduated in 1881 as a Senior Moderator and Gold Medallist in Mathematics, since which period he has acted until now as Assistant at the Observatory at Dunsink